W2x Series

Fixed Wireless Terminals for WCDMA/HSDPA Mobile Networks

Technical Product Description

ERICSSON

Contents

1 W2x Series Overview

1.1 Introduction

The Ericsson Fixed Wireless Terminal (FWT) W2x product series is the base for Ericsson WCDMA/HSDPA FWTs. The W2x product series is based on a platform concept aiming at providing a set of differentiated terminals from well-defined technical platforms.

The W2x product series consist of different types of terminals. Currently there are three terminals in the W2x product series:

- **Ericsson W20** – Data Terminal
  - W20a for 850/1900 MHz frequency bands
  - W20e for 2100 MHz frequency bands

- **Ericsson W21** – Data Terminal

- **Ericsson W25** – Data and Voice Terminal

With WCDMA/HSDPA WAN radio access capability the W2x products are well suited to provide broadband data access with data speeds similar to fixed line DSL services.

1.2 Ericsson W20/W21 - Data Terminal

The Ericsson W20/W21 provide data capabilities such as data access (e.g. Internet) in the respect that it allows multiple computers to be connected to the terminal using Ethernet or wireless LAN (WLAN).



Figure 1 - Overview of Interfaces for the Ericsson W20/W21

1.3 Ericsson W25 – Data and Voice Terminal

The Ericsson W25 data and voice terminal incorporates the same set of data features as the Ericsson W20/W21. Additionally, this model also includes voice and fax capabilities over standard analog telephone interfaces. A broad range of network services such as Prepaid Subscription, CLI (Calling Line Identification), Call Waiting, Call Barring, Call Forwarding, Multiparty Conference Calls are supported. WCDMS/HSDPA radio access is well suited for combined and efficient data and voice transmission over the mobile network.

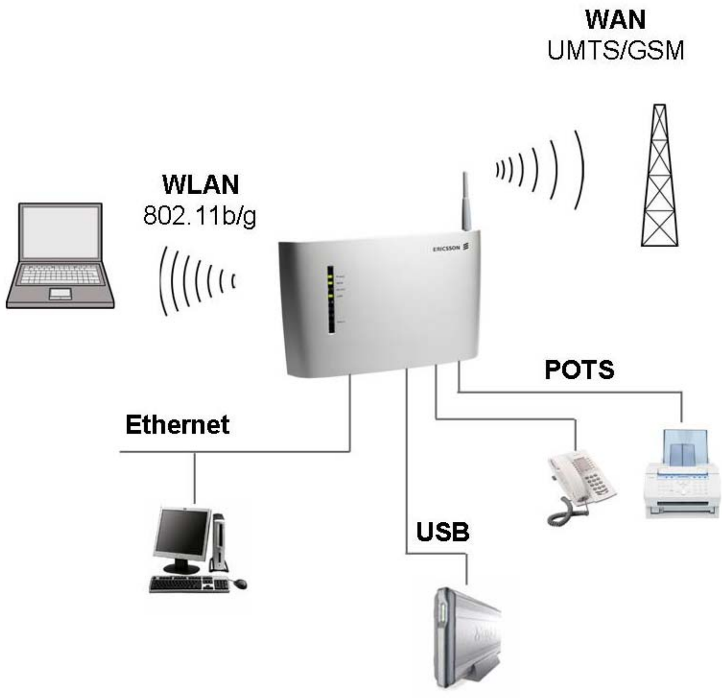


Figure 2 - Overview of Interfaces for the Ericsson W25

1.4 Ericsson W2x Feature Summary

The main features of the Ericsson W2x terminals are:

- **Multimode broadband WAN connectivity**
  WCDMA/HSDPA (850/1900/2100 MHz) as primary access and GSM/GPRS/EDGE (850/900/1800/1900 MHz) as fall-back. Peak download data rates 1.8 Mbps for Ericsson W20 and 3.6 Mbps for the Ericsson W21/W25. (The Ericsson W21/W25 is software upgradeable to 7.2 Mbps).

- **Four ports Ethernet switch;**
  Routing, NAT, ALG, DHCP and DNS Server.

- **Two USB 2.0 ports;**
  File and printer sharing.

- **Wireless LAN Access Point;**
  IEEE 802.11b/g (Wi-Fi)

- **Wireless security;**
  WEP, WPA-PSK, WPA2-PSK, MAC Association Control.

- **Analogue voice services (W25 only)**;
  Via a telephony line interface with high speech quality.

- **Analogue fax services (W25 only)**;
  Using T.38 Fax over IP protocol.

- **Local Administration;**
  Built-in web based configuration tool with wizard support.

- **SW auto update**

- **Remote Management Capability**
  Via SSH

2 Hardware Architecture

2.1 Power Supply

The W2x terminals can be powered from:

- AC Mains via an external AC/DC power adapter (10-28 VDC)
- Battery backup (Ericsson W25).

2.1.1 Power Adapter

The provided power adapter has the following characteristics:

Input: 100-240V AC, 50-60 Hz, 3 pole AC inlet connector (IEC 320 power inlet).
Output: 12 VDC.
Power consumption: 7.0 W (typical) and 11.4 W (maximum) for Ericsson W20/21 and 9.0 W (typical) and 16.2 W (maximum) for Ericsson W25.

National power plugs are available for EU, UK, US and AU.

2.1.2 Battery Backup (W25 only)

The Ericsson W25 can be fitted with a rechargeable battery to provide redundancy in case of an AC Mains power failure. The battery is available as an accessory and is facilitated within the unit. Additionally there is an internal battery charger that can recharge the battery.

2.2 UMTS/GSM Radio Interfaces

The W2x terminals support UMTS and GSM/GPRS/EDGE radio interfaces where UMTS is the primary interface.

2.2.1 UMTS

The W2x terminals support UMTS 850/1900 MHz and 2100 MHz frequency bands.

The UMTS interface supports the following characteristics:

- WCDMA
- HSDPA Category 11 and 12 (W20)
- HSDPA Category 1-6 and 11 (W21/W25)

The Ericsson W21/W25 is software upgradeable to 7.2 Mbps which means support for HSDPA Category 7 and 8.

2.2.2 GPRS/EDGE

The W2x terminals support GSM/GPRS/EDGE 850/900/1800/1900 MHz frequency bands.

2.2.3 HSDPA Throughput Rates

The peak download speed is rated up to 1.8 Mbps for the Ericsson W20 and 3.6 Mbps for the Ericsson W21 and Ericsson W25. The peak up-link speed is 384 kbps. The rated HSDPA peak download speeds will eventually evolve up to 14.4 Mbps with enhanced radio performance (increased modulation and coding schemes) according to the table below (current W2x rated peak speeds highlighted):

Category (HS-DSCH)	Peak data rate (Mbps)	No of codes (HS-DSCH)	Modulation (16QAM/QPSK)
Category 1	1.2	5	Both
Category 2	1.2	5	Both
Category 3	1.8	5	Both
Category 4	1.8	5	Both
Category 5	3.6	5	Both
Category 6	3.6	5	Both
Category 7	7.2	10	Both
Category 8	7.2	10	Both
Category 9	10.7	15	Both
Category 10	14.4	15	Both
Category 11	0.9	5	QPSK
Category 12	1.8	5	QPSK

However peak upload speeds are only possibly with normal usage in a cell and with optimal signal conditions. Typical download speeds experienced by the users with multiple concurrent voice and data users in the cell, ranges from 0.6 Mbps to 1.1 Mbps on average with current W2x series radio configuration according to simulations in urban and suburban environments. This rate will eventually evolve up to 6-7 Mbps with future radio configuration updates of the W2x series.

2.2.4 Data Transmission

The W2x terminals offer both circuit switched and packet switched of data transmission. The table below summarizes typical and theoretical data rates:

<table>
<tr><th colspan="2">Packet data service</th><th>Theoretical max data rate</th><th>Typical data rate</th><th>Category/ Multislot class</th></tr>
<tr><td rowspan="2">HSDPA</td><td>Upload</td><td>384 kbps</td><td>Over 300 kbps</td><td rowspan="2">Category 11 and 12

1-6 and 11 (*)</td></tr>
<tr><td>Download</td><td>1.8 Mbps
3.6 Mbps (*)</td><td>500-800 kbps</td></tr>
<tr><td rowspan="2">WCDMA</td><td>Upload</td><td>384 kbps</td><td>Over 300 kbps</td><td></td></tr>
<tr><td>Download</td><td>384 kbps</td><td>Over 300 kbps</td><td></td></tr>
<tr><td rowspan="2">EDGE</td><td>Upload</td><td>118 kbps</td><td>50-60 kbps</td><td rowspan="2">Multislot class 10
MCS 1-9</td></tr>
<tr><td>Download</td><td>236 kbps</td><td>100-130 kbps (with bursts over 200 kbps)</td></tr>
<tr><td rowspan="2">GPRS</td><td>Upload</td><td>43 kbps</td><td>20 kbps</td><td rowspan="2">Multislot class 10
CS 1-4</td></tr>
<tr><td>Download</td><td>86 kbps</td><td>40 kbps</td></tr>
</table>

(*) Applicable for Ericsson W21 and Ericsson W25.

2.2.5 Frequency Bands (W20)

The Ericsson W20 supports frequency bands as shown in the table below:

	Band	Frequencies (MHz)	Conducted Rx sensitivity (dBm)	Conducted Transmit Power (dBm)
W20e	Band I UMTS 2100	Tx: 1920-1980 Rx: 2110-2170	< -109	+23
W20a	Band II UMTS 1900	Tx: 1850-1910 Rx: 1930-1990	< -109	+23
	Band V UMTS 850	Tx: 824-849 Rx: 869-894	< -109	+23
W20a and W20e	GSM850	Tx: 824-849 Rx: 869-894	< -106	+32 (GMSK) +27 (8PSK)
	EGSM 900	Tx: 880-915 Rx: 925-960	< -106	
	DCS 1800	Tx: 1710-1785 Rx: 1805-1880	< -106	+29 (GMSK) +26 (8PSK)
	PCS 1900	Tx: 1850-1910 Rx: 1930-1990	< -106	

2.2.6 Frequency Bands (W21/W25)

The Ericsson W21/W25 support frequency bands as shown in the table below:

Band	Frequencies (MHz)	Conducted Rx sensitivity (dBm)	Conducted Transmit Power (dBm)
Band I UMTS 2100	Tx: 1920-1980 Rx: 2110-2170	< -109	+23
Band II UMTS 1900	Tx: 1850-1910 Rx: 1930-1990	< -109	+23
Band V UMTS 850	Tx: 824-849 Rx: 869-894	< -110	+23
GSM850	Tx: 824-849 Rx: 869-894	< -106	+32 (GMSK) +27 (8PSK)
EGSM 900	Tx: 880-915 Rx: 925-960	< -106	
DCS 1800	Tx: 1710-1785 Rx: 1805-1880	< -106	+29 (GMSK) +26 (8PSK)
PCS 1900	Tx: 1850-1910 Rx: 1930-1990	< -106	

2.2.7 Standard UMTS/GSM Antenna

The standard UMTS/GSM antenna is of quarter wave type (omni-directional in the horizontal plane), with a gain of 2 dBi. The antenna is penta-band supporting the 800/900/1800/1900/2100 MHz frequency bands. It is attached directly to the W2x terminals via an SMA antenna connector.

2.2.8 UMTS/GSM Window Antenna

The standard UMTS/GSM antenna can be replaced with an UMTS/GSM window antenna available as an accessory. This antenna is a penta-band antenna operating in the 824-960 and 1710-2170 MHz frequency bands with a gain of 2.15 dBi.

2.2.9 UMTS/GSM Roof Antenna

The standard UMTS/GSM antenna can be replaced with an UMTS/GSM roof antenna available as an accessory. This antenna is a penta-band antenna operating in the 824-960 and 1710-2170 MHz frequency bands with a gain of 11 dBi with 0.5 dBi variation over specified bands.

2.2.10 SIM/USIM Interface

The W2x terminals have a plug-in SIM/USIM card connection.

The Ericsson W20e, W21 and W25 support 1.8 and 3V SIM while the Ericsson W20a only supports 3V SIM.

2.3 Wireless LAN (WLAN) Interface

The W2x terminals act as wireless Access Point (AP) supporting IEEE 802.11b/g standards.

IEEE 802.11b operates in the unlicensed 2.4 GHz band and can theoretically achieve 11 Mb/s. Practical throughput, ranges from ~7 Mb/s (using UDP) to ~6 Mb/s (using TCP). IEEE 802.11g operates in the same band as 802.11b and has a theoretical top speed of 54 Mb/s. In practice, throughput around 25 Mb/s is more realistic.

The transmit power is configurable and is limited to maximum 20 dBm.

For wireless security the W2x terminals support WEP, WPA-PSK, WPA2-PSK and MAC Association Control.

2.3.1 Wireless Radio Channels

The table below shows the IEEE 802.11 channels and their corresponding center frequencies:

Channel Number	Channel Frequency	Geographic Indoor Usage
1	2412 MHz	US (United States), CA (Canada), ETSI (ETSI Countries), SI (Singapore), AS (Australia), NZ (New Zealand), SA (South Africa), MA (Malaysia)
2	2417 MHz	US, CA, ETSI, SI, AS, NZ, SA, MA
3	2422 MHz	US, CA, ETSI, SI, AS, NZ, SA, MA
4	2427 MHz	US, CA, ETSI, SI, AS, NZ, SA, MA
5	2432 MHz	US, CA, ETSI, SI, AS, NZ, SA, MA
6	2437 MHz	US, CA, ETSI, SI, AS, NZ, SA, MA
7	2442 MHz	US, CA, ETSI, SI, AS, NZ, SA, MA
8	2447 MHz	US, CA, ETSI, SI, AS, NZ, SA, MA
9	2452 MHz	US, CA, ETSI, SI, AS, NZ, SA, MA
10	2457 MHz	US, CA, ETSI, SI, AS, NZ, SA, MA
11	2462 MHz	US, CA, ETSI, SI, AS, NZ, SA, MA
12	2467 MHz	ETSI, SI, AS, NZ, SA, MA
13	2472 MHz	ETSI, SI, AS, NZ, SA, MA

Radio scanning makes the W2x terminals capable of sensing other access points of the allowed channel.

2.3.2 Internal WLAN Antennas

The W2x terminals have two internal WLAN antennas (omni-directional).

The antennas are mounted orthogonally for best performance.

2.4 USB Interface

The W2x terminals include a USB 2.0 Host Controller with two (2) ports (type A) supporting both full speed and high-speed. The USB interface supports one low power device per port hence the maximum power consumption of a device is 100 mA.
Maximum practical cable length for USB is 5 m.

2.5 Ethernet Interface

The W2x terminals include an Ethernet switch with four (4) external LAN 4x10/100BaseTx ports (female RJ45) for connection to PC equipment. Each Ethernet port supports rate auto-negotiation and MDI/MDIX auto-detection.
The MDI/MDIX auto detection allows the user to plug in either a straight or crossed Ethernet cable regardless of how the other end is connected. Maximum cable length for Ethernet is 100 m.

2.5.1 Built-in LED indicators

Each Ethernet connector has two built-in indicators. The left indicator shows the speed of data traffic between the W2x terminals and the connected client. If the speed is 100 Mbps, the indicator is green. When the indicator is unlit, the speed is 10 Mbps.
The indicator to the right is green when a LAN connection is established and flashes to show data traffic activity.

2.6 Telephony Interface (W25)

The Ericsson W25 includes dual POTS interface (FxS). The port marked "Phone" is the primary port to be used for making phone calls. The other port (marked "Phone/Fax") is intended for fax machines and complementary telephony services.

The ports are intended for on premises phones and should typically be connected to devices within one building. Short loops (max 500Ω) is supported.

The maximum ringing load for each port is 3 REN (corresponding to three (3) old fashioned phones with mechanical bells or twenty (20) modern phones with electronic ringing).

Characteristic impedance, gain, current etc of the ports are controlled by software. DTMF dialing are supported. The ports have protection to prevent the unit to be damaged by ESD (Electro Static Discharge).

2.7 Connectors

The bottom of the W2x terminals includes the connectors as described below.

2.7.1 W20/W21 Connectors

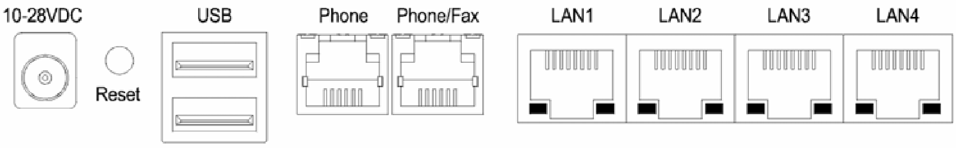
The Ericsson W20/W21 is equipped with the following connectors located at the bottom of the unit:



Text	Type	Function
10-28 VDC	Circular	Standard power inlet for connecting the included power supply adapter.
Reset	Switch	A small hole in the housing. Used to restore the unit to its factory default configuration.
USB	2 x USB-A	USB connectors, for connecting USB devices to the unit, e.g. printer or mass storage.
LAN 1-4	4 x RJ45	Ethernet LAN connectors for connecting the unit to client PCs or an Ethernet switch/hub.

2.7.2 W25 Connectors

The Ericsson W25 is equipped with the following connectors located at the bottom of the unit:



Text	Type	Function
10-28 VDC	Circular	Standard power inlet for connecting the included power supply adapter.
Reset	Switch	A small hole in the housing. Used to restore the unit to its factory default configuration.
USB	2 x USB-A	USB connectors, for connecting USB devices to the unit, e.g. printer or mass storage.
Phone	RJ11	Phone connector for connecting a standard analog phone.
Phone/ Fax	RJ11	Phone connector for connecting a standard analog phone or fax. This port is dedicated for fax connection.
LAN	4 x RJ45	Ethernet LAN connectors for connecting the unit to client PCs or an Ethernet switch/hub.

2.8 LED Indicators

The front panel of the W2x terminals include the LED indicators as described below.

2.8.1 W20/W21 LED Indicators

The following LED indicators are visible on the front of the Ericsson W20/W21:

Text	Color	Function
Power	Green Unlit	Power is on. Power is off.
Mobile Network	Green Red Flashing Unlit	The UMTS network is available. The GSM (GPRS/EDGE) network is available. Searching for a connection. No connection to the mobile network.
Internet	Green Unlit	Connection to Internet established. No Internet connection.
Wireless LAN	Green Unlit	The Wireless LAN is active. The Wireless LAN is inactive.
Alarm	Red Unlit	Error. Various error conditions (specified on the Overview web page and as an “error” message in the syslog). Refer to section 7.4.2 . No error.

2.8.2 W25 LED Indicators

The following LED indicators are visible on the front of the Ericsson W25:

Text	Color	Function
Power	Green Red Unlit	Mains powered. Battery powered. Power is off.
Mobile Network	Green Red Flashing Unlit	The UMTS network is available. The GSM (GPRS/EDGE) network is available. Searching for a connection. No connection to the mobile network.
Internet	Green Unlit	Connection to Internet established. No Internet connection.
Wireless LAN	Green Unlit	The Wireless LAN is active. The Wireless LAN is inactive.
Message Waiting	Green Unlit	New voice mail message(s) received. No new voice mail messages.
Alarm	Red Unlit	Error. Various error conditions (specified on the Overview web page and as an “error” message in the syslog). Refer to section 7.4.2 . No error.

3 Data Features and Function

3.1 Layer 2 Functions

3.1.1 Bridging LAN and WLAN

The W2x terminals support bridging/switching traffic between the LAN and WLAN interfaces.

3.1.2 WLAN Whitelist

The W2x terminals support WLAN whitelist, also known as “MAC Association Control” or “MAC Access List”. Up to 20 WLAN MAC addresses can be added to the list and the use of the whitelist is possible to enable/disable.

3.2 Internet Protocol Services

The Internet Services in the W2x terminals are based on the Internet Protocol version 4 (IPv4).

3.2.1 IP Forwarding

The W2x terminals support IP forwarding and employs ingress traffic filtering on both the LAN and the WAN interfaces.

3.2.2 DNS

The W2x terminals include a DNS proxy server which responds to DNS requests from the local LAN/WLAN. It contains a small database of local host names and addresses supplied by client DHCP requests.

In addition it also caches requests to remote DNS servers.

3.2.3 DHCP Server

The W2x terminals include a DHCP server for LAN/WLAN interfaces.

The DHCP server maintains a pool of IP addresses and distributes them to LAN/WLAN hosts whenever they are switched on. It also puts the hostname, supplied by the client DHCP request, in the local DNS proxy.

3.2.4 SNTP

The W2x terminals include a SNTP client which provides a way to synchronize the device’s own time of day setting with a remote NTP server. It is possible to specify up to three (3) different SNTP servers (for fallback).

3.2.5 NAT

The W2x terminals support dynamic one-to-many NAT - also known as NAPT. NAPT translates the source IP address of the LAN to the public WAN IP address. It also changes the source port (UDP or TCP) or the ICMP for the WAN to LAN flow. Port translation allows several LAN devices to be connected to the WAN through one public IP address.

3.2.5.1 NAT Port Forwarding

The NAT Port Forwarding feature, sometimes referred to as Virtual Server, redirects traffic from the WAN side to a server on the LAN side.

The Port Forwarding feature requires a public WAN IP address on the W2x terminals.

3.2.5.2 NAT ALGs

An ALG enables the transfer of specific application streams through firewall policies and NAT. This is enabled by creating dynamic holes in the firewall policy and NAT and changing IP addresses in network protocol headers, and if a secondary port is required, the ALG will open one.

The W2x terminals include NAT ALGs for the following protocols:

- FTP
- TFTP

The included ALGs can be enabled/disabled individually and do not require any additional configuration.

3.2.6 IP Quality of Service

The QoS service in the W2x terminals support the Stochastic Fair Queuing (SFQ) scheduling algorithm which makes sure that no single session can dominate outgoing bandwidth.

The QoS feature applies for upstream traffic only.

3.2.7 UPnP

The W2x terminals support the UPnP standard with respect to the Internet Gateway Device (IGD) profile, used by Microsoft Messenger (among others) to configure port forwarding in a NAT router.

3.2.8 VPN Pass-Through

The W2x terminals support IPSec VPN (Virtual Private Network) pass-through.

3.2.9 PPP Clients

The W2x terminals include a PPP client for WAN access.

For authentication both the PAP (Password Authentication Protocol) and CHAP (Challenge Handshake authentication Protocol) protocols are supported.

3.2.10 SIP (W25 only)

The Ericsson W25 supports the SIP protocol (RFC 3261) for T.38 Fax over IP.

3.3 USB Services

The W2x terminals function as a network storage device for LAN hosts using SMB/CIFS (as printer and file sharing in Windows).

It is possible to have two storage devices *or* a storage device and a printer connected to the W2x terminal at the same time. When an external hub is connected, the W2x terminals support connection of up to two storage devices and one printer at the same time. Both USB 1.1 and 2.0 (full speed and high-speed) are supported.

3.4 Authentication

Authentication towards the UMTS/GSM radio network can be done via either PIN code or PPP username and password.

4 Telephony Features (W25 only)

The Ericsson W25 provides analogue voice services via the telephony line interface with high speech quality.

4.1 Line Interface

The POTS (FxS) interface can be configured, i.e. impedance, frequency, cadence, levels etc.

DTMF dialing is supported.

4.1.1 Ringing Signal

It is possible to configure different ringing signals depending on the call type.

The mapping and ring frequency are also configurable.

4.1.2 CLIP, CWI and Voice Mail Alert

The Ericsson W25 supports CLIP (Calling Line Identification Presentation) service in both on-hook and off-hook state using the DTMF and FSK protocols and is also supporting Bellcore standard.
It is possible to configure a country specific profile for the CLIP services.

The Ericsson W25 also supports the CWI (Call Waiting Indication) service over the POTS interface. If there is a message in the user voice mailbox this is indicated by the “Message Waiting” LED and by a special tone played in the telephone.

The “Message Waiting” LED and tone is activated/deactivated by OTA SMS messages.

4.1.3 Hook Flash

Hook flash functionality for the POTS interface is supported and configurable.

4.2 UMTS/GSM Supplementary Services

The Ericsson W25 supports UMTS/GSM supplementary services as listed below. In order to use the services, the operator network must support them. Offered supplementary services can only be used with a DTMF telephone connected to the unit.

- Calling Line Identification Presentation (CLIP)
- Calling Line Identification Restriction (CLIR)
- Call Forwarding Unconditional
- Call Forwarding on Mobile Subscriber Busy
- Call Forwarding on No Reply
- Call Forwarding on Mobile Subscriber Not Reachable
- Call Waiting

- Call Hold
- Multi Party Service
- Barring of All Outgoing Calls
- Barring of Outgoing International Calls
- Barring of Outgoing Internal Calls except those directed to the Home PLMN Country
- Barring of All Incoming Calls
- Barring of Incoming Calls when Roaming Outside the Home PLMN Country.

4.3 Dial Process

The Ericsson W25 supports E.164 numbering. There are three ways to indicate that the dialed number sequence is complete:

- Dialing the EON key (e.g. # or *) immediately sends the call.
- An Inter Digit Timer (IDT) is used to check the dialing process.
- A specified number of digits must be dialed before the call is placed.

The EON key is configurable as well as the IDT.

4.3.1 Dialed Number Modification

It is possible to do number modifications, e.g. remove and/or add digits to a dialed number.

The dial plan consists of a pattern string to match dialed digits, and the ability to strip, append prefix digits, and/or append suffix digits.

4.3.2 Local Call Prefix

A local prefix can automatically be added to a dialed local number. This is useful in places where the PSTN does not require the local prefix in local calls.

4.3.3 Fixed Number Dialing

Fixed Number Dialing is supported when a SIM providing this service is installed. When enabled, only calls to fixed numbers stored on the SIM are allowed.

4.3.4 Fax Dialing

A local fax call is detected through a unique prefix before the phone number. The fax prefix is configurable and is removed before the T.38 call is setup.

4.3.5 Supplementary Services

The UMTS/GMS supplementary service codes (i.e. #67# etc) is possible to configure with a service code of choice, in order to have the same service codes as in a fixed network.

4.4 DTMF Transmission

The Ericsson W25 is capable of transmitting DTMF on the radio interface as received on the 2W-line interface using message based signaling.

It is possible to switch of the DTMF message based signaling so that DTMF tones go through the voice code.

The Ericsson W25 supports DTMF digits 0-9 and A&B.

4.5 Emergency Calls

Emergency calls (i.e. 112 or 911) can always be made, even without a SIM card or the correct PIN code. This also applies if the terminal is locked to the network by a specific MCC and/or MNC or if the PIN Lock feature is enabled.

The emergency telephone number may differ from country to country. It is typically a three-digit number so that it can be easily remembered and dialed quickly. Some countries have a different emergency number for each of the different emergency services; these often differ only by the last digit.

Emergency calls have its own dial plan and multiple numbers can be configured.

5 Fax Support (W25 only)

To enable Fax support the Ericsson W25 uses the Voice over IP (VoIP) protocol called SIP.

The Ericsson W25 works as a fax gateway between the POTS interface and the IP network using the T.38 protocol. The fax machine is connected to one of the two POTS interfaces on the Ericsson W25, which is dedicated for a fax machine.

Connected to this fax port is a SIP user agent, which manages and controls the media streams by using the SIP protocol towards the SIP server and media Gateway.

5.1 Signaling

The Ericsson W25 conforms to the SIP protocol (RFC 3261).

5.2 Security

The Ericsson W25 authenticates towards the VoIP system using the HTTP Digest Authentication mechanism.

5.3 Media Stream

To transfer the fax call the T.38 protocol is used.

5.3.1 Jitter Buffer

To handle latency and jitter the W25 has a jitter buffer.

5.3.2 Echo Canceller

To improve the fax transfer, the Ericsson W25 has an echo canceller in accordance with G.168.

5.3.3 QoS

The outgoing VoIP related traffic will be prioritized before other traffic from the Ericsson W25 to reduce the uplink delay and jitter.

6 Wireless LAN (WLAN)

6.1 SSIDs

The W2x terminals support single SSID. This SSID and a unique MAC address are broadcasted in the beacon at regular intervals.

The SSID name can be set (changed) with a maximum length of 32 alphanumeric characters. It is also possible to configure the SSID to be hidden.

The SSID can be either “open” (no authentication or encryption) or “closed” (meaning either WEP or WPA security). See below for security details.

6.2 Wireless Security

Authentication and data encryption are used to restrict access to the wireless network. Which authentication and encryption method that should be used depends on what is supported by the connecting wireless device(s).

The W2x terminals support the following WLAN security protocols:

- WEP with both 64- and 128-bit key lengths.
- WPA-PSK
- WPA2-PSK

6.2.1 WEP

WEP enables wireless security using 64-bit or 128-bit data encryption. WEP encryption requires a private network key. Each device in the wireless network has to be manually configured with this key.

6.2.2 WPA / WPA2

WPA is a 256-bit data encryption method with keys that dynamically change over time. WPA and its successor WPA 2 are considered to be the most reliable security options.

For user authentication WPA/WPA2 runs a special, easy-to-set-up home mode called Pre-Shared Key (PSK) where keys and passphrases are manually entered.

WPA encryption uses the Temporal Key Integrity Protocol (TKIP) while WPA2 encryption follows the Advanced Encryption Standard (AES).

6.2.3 Whitelist

A common method of restricting WLAN network access is to specify the MAC address(es) in a so called “whitelist” for those computers access are granted. Up to 20 MAC addresses for wireless clients can be added to the whitelist. This feature does not require any configuration of the clients but on the other hand it does not encrypt the traffic like WEP/WPA.

7 Configuration and Management

7.1 Web User Interface

The end-user configures the W2x terminals through a web user interface (WUI) that is accessible through the LAN and WLAN interfaces.

The WUI also includes a Configuration Wizard for easy setup of the local Internet connection and wireless network.

7.2 Command Line Interface

The CLI is mainly intended for operator service personnel handling tasks like storing/exchanging configuration files and for maintenance purpose (i.e. fault location and tracing).

Remote access to the CLI is possible using SSH2 and local access through Telnet.

7.3 Access Control

The access control in the W2x terminals is applicable for all interfaces, i.e. CLI, WUI and remote management.

Multiple users and groups are supported and each user has its own username and password and is a member of one or several groups.

By default there are three accounts available, where:

- The end-user (user-id **user**), using the WUI, is allowed to access functions and configuration parameters related to WAN authentication, LAN settings, NAT and port forwarding, WLAN access point and USB file sharing.
  This account can only be used when accessing the WUI and has no access rights to the CLI.

- The operator (user-id **operator**), using the CLI, in addition to the end-user privileges also is allowed to access additional WAN and telephony related configuration parameters and trouble shooting.

- An administrator account (user-id **root**), using the CLI, has full permissions.

Each configuration parameter has an access control specification determining what action (read or write) the user/group is allowed to perform.

7.4 Management Tools

7.4.1 Software Update

The W2x terminals run Linux OS on an Intel hardware platform. The flash file system is formatted as two partitions, each capable of holding a complete software image. If a software update process should get interrupted, e.g. power failure during the update process, there is always a last known good firmware image to boot from.

7.4.1.1 Manual Software Update

Manual software updates is supported from FTP or HTTP(S) servers. It is also possible to upgrade the software via a browser button in the WUI from a local computer.

7.4.1.2 Automatic Software Update

Automatic software updates from Ericsson's update server are supported. In this case, the W2x terminals will at regular intervals poll the update server for updates. If there is an image available a download and upgrade process is initiated.

7.4.1.3 Backup and Restore Configuration

By using the WUI, the end-user can backup and restore configuration files to/from a local PC.

7.4.2 System Log

The W2x terminals include a system log accessible both from the CLI and WUI as a text file.

The system logging information is written to 5 files which are rotated in a circular fashion. The files are limited to 200Kbytes each, which equals a maximum of 1 MB total logging information. The files are not saved to flash and will be lost when rebooting or when power is disconnected.

When persistent logging is enabled, the log files are written to flash memory in two files alternately.

Different levels of logging (Emergency, Alert, Critical, Error, Warning, Notice, Info and Debug) can be set depending on how much information is desired.

The syslog events can be saved to a local file or forwarded to remote syslog server.

7.4.2.1 BSD Syslog Remote Logging

The W2x terminals are able to distribute none, some or all system log events using the BSD Syslog message format on UDP.

7.4.3 Fault Management

If an error condition occurs, the "Alarm" LED on the unit is lit (red) and the corresponding cause is displayed in the WUI (on the Overview page). An event message with severity level "Error" is also generated in the syslog.

Events that generate an alarm are such that make it impossible to send or receive data, e.g. SIM card missing.

7.4.3.1 Interface Status and Statistics

The following status/statistics information can be displayed from the WUI as well as from the CLI:

WAN interface	The mobile network (UMTS or GSM) signal quality. (*) Link status: up/down The protocol/mode used for the connection. The mobile network currently used for the connection (HSDPA, UMTS, GPRS, EDGE). Name of the mobile network operator. The current state of the mobile network registration. WAN IP address DNS IP address(es) Total transmitted/received bytes and packets Amount of error/dropped/overrun packets
LAN interface	LAN IP address and subnet mask DHCP server IP address range and lease time Port status (up/down) for each physical LAN port Total transmitted/received bytes and packets
WLAN interface	Current associations (MAC address) Current successful authenticated associations (MAC address and state)

(*) The visual signal quality bars are not only based on signal strength (RSCP). It also takes the EC/I0 (energy to noise and interference ratio), since the bandwidth is depended on both values. The CQI (Channel Quality Indicator) value is also visible from the CLI during a HSDPA connection.

7.4.4 Security Management

All invalid login attempts are recorded in the System Log.
When attempting to log in remotely via SSH or locally via Telnet, the user is given three login attempts and then the session is ended.

7.4.5 TEMS Investigation Support

The W2x terminals support TEMS Investigation. TEMS Investigation is the industry-leading tool for troubleshooting, verification, optimization, and maintenance of mobile networks.

TEMS Investigation connects to the W2x terminals via a virtual serial port on a computer to the W2x over the Ethernet interface. The computer that runs the TEMS investigation tool needs a virtual serial driver as well.

For further information about TEMS Investigation, see the following link:
http://www.ericsson.com/solutions/tems/realtime_diagnostics/investigation.shtml

8 Security

The basic security feature of the W2x terminals are the same as any GSM phone, using a PIN code that comes with the subscription SIM card. The PIN code is simply entered via the WUI. To simplify usage, the W2x terminals have an auto PIN feature that requires the PIN code only to be entered the first time the unit is used or upon changing the SIM card.

Additionally the W2x terminals provide security features that prevent unauthorized use of the SIM card and the unit, which can be customized if required.

8.1 Operator Lock

This feature controls the W2x terminals network access, based on whether the SIM matches one or more of the following criteria:

- Mobile Country Code (MCC) and Mobile Network Code (MNC)
- Additional Mobile Country Code (MCC+) and Additional Mobile Network Code (MNC+)

MCCs are defined in ITU E.212 (“Land Mobile Numbering Plan”) for use in identifying mobile stations in wireless telephone networks, particularly GSM and UMTS networks. A MCC is often used in combination with a Mobile Network Code (MNC) in order to uniquely identify a network operator.

Both the MCC and MNC are part of the International Mobile Subscriber Identity (IMSI) number, which uniquely identifies a particular subscriber, and is stored on the SIM card.

The unit can be locked to one or two specific mobile network providers.

8.2 PIN Lock

This feature locks the SIM card to a unique unit by changing the PIN code to a new randomly value. As a result, the SIM card cannot be used in another terminal unless the PUK code is known.

8.3 Mechanical Anti-Theft Kit

A mechanical anti-theft kit is available as an accessory. The kit consists of a wall bracket with an anti-theft detail and a special anti-theft key for removing a unit that is locked to the wall bracket.

9 Regulatory Approvals

The W2x terminals are certified with EU Directives for the CE mark, Safety approvals, EMC and Radio Spectrum approvals and RF Exposure approvals for the following markets:

- EU
- USA
- Canada
- Australia
- New Zealand
- Malaysia
- South Africa
- Singapore.

9.1 RoHS Directive

The W2x terminals meet the requirements of the RoHS directive.

9.2 WEEE Marking

The W2x terminals meet the requirements in the WEEE directive and are marked accordingly.

9.3 SAR

SAR (Specific Absorption Rate) measurements are performed on the W2x terminals to establish compliance with national and international RF limits.

9.4 Environmental

The W2x terminals meet the following requirements for operational condition:

- Temperature: 0°C to +50°C.
- Humidity: 5% to 95% RH, non-condensing.

9.5 Intended Use

The W2x terminals are intended for indoor private and public use.

10 Acronyms and Abbreviations

ALG
Application Layer Gateway

AES
Advanced Encryption Standard

AP
Access Point

APN
Access Point Name

CDMA
Code Division Multiple Access

CHAP
Challenge Handshake Authentication Protocol

CLI
Command Line Interface

CLI
Calling Line Identification

CLIP
Calling Line Identification Presentation

CLIR
Calling Line Identification Restriction

CWI
Call Waiting Indication

DHCP
Dynamic Host Configuration Protocol

DNS
Domain Name System (or Service)

DSL
Digital Subscriber Line

DTMF
Dual Tone Multi Frequency (signaling)

EDGE
Enhanced Data rates for Global Evolution

EGSM
Enhanced GSM

EON
End Of Number

FTP
File Transfer Protocol

FXS
Foreign eXchange Station

FWT
Fixed Wireless Terminal

G3
Group 3 (Fax protocol)

GMSK
Gaussian Minimum Shift Keying data transmit

GPRS
General Packet Radio Service

GSM
Global System for Mobile Communication

HSDPA
High Speed Downlink Packet Access

IDT
Inter Digit Time

IMSI
International Mobile Subscriber Identity

IP
Internet Protocol

IPv4
Internet Protocol version 4

LAN
Local Area Network

LED
Light Emitting Diode

MCC
Mobile Country Code

MNC
Mobile Network Code

NAT
Network Address Translation

OTA
Over-The-Air programming

PAP
Password Authentication Protocol

PDP
Packet Data Protocol

PIN
Personal Identification Number

POTS
Plain Old Telephone Service

PPP
Point-to-Point Protocol

PSK
Pre-Shared Key

PSTN
Public Switched Telephony Network

PUK
Personal Unblocking Key

QoS
Quality of Service

RIP
Routing Information Protocol

SIM
Subscriber Identity Module

SMS
Short Message Service

SNTP
Simple Network Timing Protocol

SSH
Secure Shell

SSID
Service Set Identifier

TCP
Transmission Control Protocol

TEMS
TEst Mobile Stations

TFTP
Trivial File Transfer Protocol

TKIP
Temporal Key Integrity Protocol

UDP
User Datagram Protocol

UPnP
Universal Plug and Play

UMTS
Universal Mobile Telecommunications Service

USB
Universal Serial Bus

VAD
Voice Activity Detection

VoIP
Voice over IP

VPN
Virtual Private Network

WAN
Wide Area Network

WCDMA
Wideband CDMA

WEP
Wired Equivalent Privacy

WLAN
Wireless LAN

WPA
WiFi Protected Access

WUI
Web User Interface

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